9. Isabel

Program Name: Isabel.java Input File: isabel.dat

In computer science class, Isabel has been studying binary numbers, and has made up a game to practice her binary skills. She understands the binary place value system, where the first (rightmost) column is worth 1, the second worth 2, and then 4, 8, and so on. She has decided to label these columns A, B, C, etc., with A being the label for the rightmost ones place, B the 2s place, C the 4s place, etc. It helps her to see the whole picture when she arranges the numbers in column format, like this:

```
Base Two     Base ten
C B A
0 0 0 =      0
0 0 1 =      1
0 1 0 =      2
0 1 1 =      3
1 0 0 =      4
1 0 1 =      5
1 1 0 =      6
1 1 1 =      7
```

She sees that for this base ten range of values from 1 to 7, the number 6 has 1s in columns B and C. The numbers that all have 1s in the A column are 1, 3, 5, and 7. The numbers that have 1s in the B column are 2, 3, 6, and 7. In the C column, 1s correspond to the values 4, 5, 6 and 7.

Her game goes like this. She picks a random number between 1 and 500 representing the range of values within which her mystery number will be. She then picks a random letter that would represent one of the columns in the binary form of the maximum number in her range, and then one or more other letters, also column labels within the range of the maximum number's binary form. She then tries to figure out the resulting number, where there would be a 1 in each of the binary columns represented by the letters she picked. After she gets the number, she then counts how many other values have a 1 in the column of the first letter she picked.

For example, if she picked 7 as the maximum value in her mystery number range, and then picked first the letter B, as well as another letter C, the binary form of the mystery number would be 110, since there is a 1 in both the C and B columns but not the A column. This number converted to base ten is the value 6, her mystery number. The other numbers between 1 and 7 that also have a 1 in the B column (the first letter she picked) of their binary forms are 2, 3, and 7, making a total of 4 values that have 1s in the B column within that range.

In another example, with 15 as the maximum range value, and only the letter A picked, the resulting binary form of the mystery number only has a 1 in the A column, making 0001, which is equal to the decimal value 1. Other numbers from 1 to 15 that also have a 1 in the A column are the values 3, 5, 7, 9, 11, 13, and 15, for a total of 8 values.

Input: Several data sets, each on one line with single space separation, consisting of an integer M for the maximum range value ($1<M<=500$), an integer N for the number of letters to follow, and then N capital letters. The letters given will correspond to the binary place values, with A always indicating the ones place, B the 2s place, C the 4s place, D, E, F, and so on.

Output: Two integer values, the first of which is the base ten mystery number represented by 1s in the input letter column labels, as described above, and then a value representing the number of integers within the given range, whose binary form contains a 1 in the column matching the first letter listed in the data set.

Assumptions: All letters in each data set will be unique, and the number and nature of the letters given will not exceed the number of columns required for the binary form of the maximum value indicated.

Sample input:

```
7 2 B C
15 1 A
10 2 B A
130 4 F D E G
```

Sample output:

```
6 4
1 8
3 5
120 64
```